Small Business Innovation Research/Small Business Tech Transfer

# Downlink Fiber Laser Transmitter for Deep Space Communication, Phase II



Completed Technology Project (2013 - 2015)

### **Project Introduction**

NASA's Space Communications and Navigation (SCaN) roadmap, calls for an integrated network approach to communication and navigation needs for robotic and human space exploration missions, from near-Earth to planetary missions. Anytime, anywhere connectivity for Earth, Moon and Mars is a stated goal, with high-bandwidth optical relay crosslinks for Earth, Moon, Mars and planets. Laser based optical communication links for space provides more than an order of magnitude higher data rates than corresponding RF links.. In addition, this is achieved with much smaller size, weight & power (SWaP) burden to spacecraft payloads, making spacecraft resources available to enhance or extend science missions, and the overall mission productivity. Tremendous progress made in 1.5um & 1-um fiber-optic fiber laser/amplifier technologies, their power scaling, and availability of reliable high-power components, makes such transmitters feasible for space mission application. In this SBIR proposal, we propose to develop 1.5mm fiber-amplifier based laser transmitters, with Pavq>4W, and compatible with a variety of M-ary PPM formats, that have a clear path to a space-qualification roadmap. In addition, power-scaling to 10W, athermal operation over a wide temperature range (with passive conductive cooling only), and improved power efficiency, are simultaneously addressed. Limited scope qualification tests relevant for space environment will also be conducted. These activities leverage prior and ongoing related activities at Fibertek, on high-performance, high-reliability fiber laser transmitters.

#### **Primary U.S. Work Locations and Key Partners**





Downlink Fiber Laser Transmitter for Deep Space Communication Project Image

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Organizations Performing Work	Role	Туре	Location
Fibertek, Inc.	Lead Organization	Industry	Herndon, Virginia
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	Virginia

#### **Project Transitions**

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January 2013: Project Start



April 2015: Closed out

#### **Closeout Documentation:**

• Final Summary Chart(https://techport.nasa.gov/file/137313)

#### **Images**



#### **Project Image**

Downlink Fiber Laser Transmitter for Deep Space Communication Project Image (https://techport.nasa.gov/imag e/127378)

## Organizational Responsibility

# Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

#### **Lead Organization:**

Fibertek, Inc.

#### **Responsible Program:**

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### **Project Management**

#### **Program Director:**

Jason L Kessler

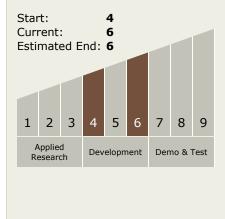
#### **Program Manager:**

Carlos Torrez

#### **Principal Investigator:**

Doruk Engin

# Technology Maturity (TRL)





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### **Technology Areas**

#### **Primary:**

 TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
TX05.1 Optical Communications
TX05.1.3 Lasers

### **Target Destinations**

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System

